Where:

x_{NMHC} = concentration of NMHC.

$x_{THC[THC–FID]cor}$ = concentration of THC, HC contamination and dry-to-wet corrected, as measured by the THC FID during sampling while bypassing the NMC.

$PF_{CH4[NMC–FID]}$ = nonmethane cutter CH_4 penetration fraction, according to § 1065.365(e).

$x_{THC[NMC–FID]}$ = concentration of THC, HC contamination (optional) and dry-to-wet corrected, as measured by the THC FID during sampling through the NMC.

$PF_{C2H6[NMC–FID]}$ = nonmethane cutter ethane penetration fraction, according to § 1065.365(e).

Example:

$x_{THC[THC–FID]cor}$ = 150.3 µmol/mol
$PF_{CH4[NMC–FID]}$ = 0.990
$x_{THC[NMC–FID]}$ = 20.5 µmol/mol
$PF_{C2H6[NMC–FID]}$ = 0.020

$$x_{NMHC} = \frac{150.3 \cdot 0.990 - 20.5}{0.990 - 0.020}$$

x_{NMHC} = 132.3 µmol/mol

(iii) For penetration fractions determined using an NMC configuration as outlined in § 1065.365(f), use the following equation:

$$x_{NMHC} = \frac{x_{THC[THC\text{-}FID]cor} \cdot PF_{CH4[NMC\text{-}FID]} - x_{THC[NMC\text{-}FID]} \cdot RF_{CH4[THC\text{-}FID]}}{PF_{CH4[NMC\text{-}FID]} - RFPF_{C2H6[NMC\text{-}FID]} \cdot RF_{CH4[THC\text{-}FID]}} \qquad \text{Eq. 1065.660-4}$$

Where:

x_{NMHC} = concentration of NMHC.

$x_{THC[THC\text{-}FID]cor}$ = concentration of THC, HC contamination and dry-to-wet corrected, as measured by the THC FID during sampling while bypassing the NMC.

$PF_{CH4[NMC\text{-}FID]}$ = nonmethane cutter CH_4 penetration fraction, according to § 1065.365(f).

$x_{THC[NMC\text{-}FID]}$ = concentration of THC, HC contamination (optional) and dry-to-wet corrected, as measured by the THC FID during sampling through the NMC.

$RFPF_{C2H6[NMC\text{-}FID]}$ = nonmethane cutter CH_4 combined ethane response factor and penetration fraction, according to § 1065.365(f).

$RF_{CH4[THC\text{-}FID]}$ = response factor of THC FID to CH_4, according to § 1065.360(d).

Example:

$x_{THC[THC\text{-}FID]cor}$ = 150.3 µmol/mol
$PF_{CH4[NMC\text{-}FID]}$ = 0.990
$x_{THC[NMC\text{-}FID]}$ = 20.5 µmol/mol
$RFPF_{C2H6[NMC\text{-}FID]}$ = 0.019
$RF_{CH4[THC\text{-}FID]}$ = 0.980

$$x_{NMHC} = \frac{150.3 \cdot 0.990 - 20.5 \cdot 0.980}{0.990 - 0.019 \cdot 0.980}$$

x_{NMHC} = 132.5 µmol/mol

(3) For a gas chromatograph, calculate x_{NMHC} using the THC analyzer's response factor (RF) for CH_4, from § 1065.360, and the HC contamination and wet-to-dry corrected initial THC concentration $x_{THC[THC\text{-}FID]cor}$ as determined in section (a) above as follows:

$$x_{NMHC} = x_{THC[THC\text{-}FID]cor} - RF_{CH4[THC\text{-}FID]} \cdot x_{CH4} \qquad \text{Eq. 1065.660-5}$$

Where:

x_{NMHC} = concentration of NMHC.

$x_{THC[THC\text{-}FID]cor}$ = concentration of THC, HC contamination and dry-to-wet corrected, as measured by the THC FID.

x_{CH4} = concentration of CH_4, HC contamination (optional) and dry-to-wet corrected, as measured by the gas chromatograph FID.

$RF_{CH4[THC\text{-}FID]}$ = response factor of THC-FID to CH_4.

Example:

$x_{THC[THC\text{-}FID][cor}$ = 145.6 µmol/mol
$RF_{CH4[THC\text{-}FID]}$ = 0.970
x_{CH4} = 18.9 µmol/mol
$x_{NMHC} = 145.6 - 0.970 \cdot 18.9$
x_{NMHC} = 127.3 µmol/mol

§ 1065.665 THCE and NMHCE determination.

(a) If you measured an oxygenated hydrocarbon's mass concentration (per mole of exhaust), first calculate its molar concentration by dividing its mass concentration by the effective molar mass of the oxygenated hydrocarbon, then multiply each oxygenated

hydrocarbon's molar concentration by its respective number of carbon atoms per molecule. Add these C_1-equivalent molar concentrations to the molar concentration of NOTHC. The result is the molar concentration of THCE. Calculate THCE concentration using the following equations:

$$x_{THCE} = x_{NOTHC} + \sum_{i=1}^{N} x_{OHC_i} - x_{THCEinit} \qquad \text{Eq. 1065.665-1}$$

$$x_{NOTHC} = x_{THC} - \sum_{i=1}^{N} \left(x_{OHCi} \cdot RF_{OHCi} \cdot C^{\#} \right) \qquad \text{Eq. 1065.665-2}$$

$$x_{OHCi} = \frac{M_{exhOHCi} \cdot m_{dexhOHC}}{M_{OHCi} \cdot m_{dexh}} = \frac{n_{dexhOHC}}{n_{dexh}} \qquad \text{Eq. 1065.665-3}$$

Where:

x_{OHCi} = The C_1-equivalent concentration of oxygenated species *i* in diluted exhaust.

x_{THC} = The C_1-equivalent FID response to NOTHC and all OHC in diluted exhaust.

RF_{OHCi} = The response factor of the FID to species *i* relative to propane on a C_1-equivalent basis.

$C^{\#}$ = the mean number of carbon atoms in the particular compound.

(b) If we require you to determine NMHCE, use the following equation:

$$x_{NMHCE} = x_{THCE} - x_{CH4} \cdot RF_{CH4} \qquad \text{Eq. 1065.665-4}$$

(c) The following example shows how to determine NMHCE emissions based on ethanol (C_2H_5OH) and methanol (CH_3OH) molar concentrations, and acetaldehyde (C_2H_4O) and formaldehyde (HCHO) as mass concentrations:

x_{NMHC} = 127.3 µmol/mol
x_{C2H5OH} = 100.8 µmol/mol
x_{CH3OH} = 25.5 µmol/mol
$M_{exhC2H4O}$ = 0.841 mg/mol
$M_{exhHCHO}$ = 39.0 µg/mol
M_{C2H4O} = 44.05256 g/mol
M_{HCHO} = 30.02598 g/mol
x_{C2H4O} = 0.841/44.05256 1000
x_{C2H4O} = 19.1 µmol/mol
x_{HCHO} = 39/30.02598
x_{HCHO} = 1.3 µmol/mol
x_{NMHCE} = 127.3 + 2 100.8 + 25.5 + 2 19.1 + 1.3
x_{NMHCE} = 393.9 µmol/mol

EFFECTIVE DATE NOTE: At 73 FR 37337, June 30, 2008, §1065.665 was revised, effective July 7, 2008. For the convenience of the user, the revised text is set forth as follows:

§1065.665 THCE and NMHCE determination.

(a) If you measured an oxygenated hydrocarbon's mass concentration, first calculate its molar concentration in the exhaust sample stream from which the sample was taken (raw or diluted exhaust), and convert this into a C_1-equivalent molar concentration. Add these C_1-equivalent molar concentrations to the molar concentration of NOTHC. The result is the molar concentration of THCE. Calculate THCE concentration using the following equations, noting that equation 1065.665–3 is only required if you need to convert your OHC concentration from mass to moles:

$$x_{THCE} = x_{NOTHC} + \sum_{i=1}^{N} \left(x_{OHCi} - x_{OHCi\text{-init}} \right) \qquad \text{Eq. 1065.665-1}$$